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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/939,323	08/24/2001	Wei-Yung Hsu	AMAT/5617/CMP/CMP/RKK	3877

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APPLIED MATERIALS, INC.  
2881 SCOTT BLVD. M/S 2061  
SANTA CLARA, CA 95050

EXAMINER
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MACKEY, TERRENCE M

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 02/19/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Applicant(s)

Applicant(s)

09/939,323

HSU ET AL.

Examiner

Art Unit

Terrence Mackey

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1 - 39 is/are pending in the application.
- 4a) Of the above claim(s) 18 - 39 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 - 17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restrictions***

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1 – 17, drawn to a method for processing a substrate having steps for depositing material and subsequently polishing the material to form a planar surface, classified in class 438, subclass 697.
- II. Claims 18 - 39, drawn to an apparatus for polishing a substrate having two or more processing stations, classified in class 29, subclass 25.01.

The inventions are distinct from each other because:

Inventions claims 1 – 17 and claims 18 - 39 are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus can be used to perform a discrete polishing operation or a discrete deposition operation upon a workpiece.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Brian Hrma on January 15, 2003, a provisional election was made with traverse to prosecute the invention drawn to a process for removing dielectric material from a substrate using an abrasive free

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polishing composition, claims 1 – 17. Affirmation of this election must be made by applicant in replying to this Office action. Claims 18 – 39 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 2 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Use of “the conductive material” in claim 2 fails to specify whether this is to be the first conductive material or second conductive material of claim1.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application

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being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 1 – 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Liu et al, '223. Applicant discloses a method for processing a substrate comprising providing a substrate having feature definitions formed in a dielectric material, depositing a barrier layer material on the substrate surface and within the feature definitions, depositing a first conductive layer on the barrier layer to fill the feature definitions, polishing the first conductive material to at least the top surface of the barrier layer material, depositing a second conductive material by an electrochemical deposition technique to fill recesses formed in the first conductive material, and polishing the second conductive material to at least the top surface of the dielectric layer to form a planar surface. Applicant further claims various conductive materials that may be used as the first and second conductive materials, one of the claimed materials being copper.

Liu et al, '223, disclose a method for eliminating dishing of copper interconnects by forming a dielectric layer on a semiconductor substrate, forming trenches within the dielectric layer, depositing a barrier layer over the dielectric layer thereby lining the trench, depositing copper on the barrier layer to form a first copper layer filling the lined trench, planarizing the first copper layer and barrier layer thereby re-exposing the upper surface of the dielectric layer but also dishing the copper-filled trench, and selectively depositing copper on the dished copper-filled trench to form a second copper layer over the dished-copper-filled trench and extending above the upper surface of the dielectric

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layer. Liu et al, '223, additionally discloses that the second copper layer may be deposited by electroless plating or electrochemical deposition and that the second copper layer may be planarized to form an essentially planar copper interconnect (claim 4). Liu et al, '223, disclose that a copper seed layer may also be deposited on the barrier layer prior to the deposition of the first copper layer (column 3, lines 30-36). Liu et al, '223, also disclose that the dielectric layer is between 4000 and 10,000 Å thick with the barrier layer being between 100 and 500 Å thick and the first copper layer being between 1000 and 2500 Å thick. Deposition of the second copper layer to a thickness of 2000 Å will result in the upper surface of the second copper layer extending above the upper surface segments of the dielectric layer prior to the planarization thereof.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8 – 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al, '223, as applied to claim 1 above, and further in view of Iacoponi et al. Liu et al, '223, teach the above method for depositing and polishing various layers on a semiconductor substrate to form conductive interconnects but does not teach the use of annealing or rinsing steps nor the use of a manufacturing system having multiple processing stations.

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Iacoponi et al teach annealing of a deposited copper trench-fill layer to control the mechanical stress of the deposited copper layer (column 6, lines 23 – 46). Iacoponi et al also teach the use of a manufacturing system having multiple stations (column 9, line 58 - column 10, line 4) with the additional of intermediate processing steps including rinsing (column 9, line 67).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the annealing and rinsing steps taught by Iacoponi et al in the process taught by Liu so that the mechanical stresses and quality of the resulting conductive interconnects would be improved.

Claims 11 – 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al, '223, in view of Iacoponi et al, and further in view of Zhang.

Liu et al, '223, teach the above method for depositing and polishing various layers on a semiconductor substrate to form conductive interconnects. Iacoponi et al teach the above method for forming conductive interconnects including steps for annealing and rinsing the workpiece and also the use of a manufacturing system having multiple stations for performing the various process steps, however neither reference teaches the concurrent deposition and polishing of a conductive layer.

Zhang teaches a method for concurrent deposition and polishing of a conductive layer which facilitates the efficient manufacture of electrical interconnections between components of an integrate circuit.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the concurrent deposition and polishing method taught by

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Zhang in the process taught by the combination of Liu and Iacoponi to improve the efficiency of the process for forming conductive interconnects.

### ***Conclusion***

Claims 1 - 17 are rejected.

Remaining references cited of interest show the state of the art.

Papers relating to this application may be submitted to Technology Sector 1700 by facsimile transmission. Papers should be faxed to Crystal Plaza 3, Art Unit 1765, using fax number (703) 305-6357. All Technology Section 1700 fax machines are available to receive transmissions 24 hrs/day, 7 days/wk. Please note that the faxing of such papers must conform to the Notice published in the Official Gazette, 1096 OG 30, (November 15, 1989).

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Terrence Mackey whose telephone number is (703) 305-5504. The Examiner can normally be reached Monday - Friday from 7:00 AM - 4:30 PM.

If attempts to reach the Examiner by telephone are unsuccessful, the examiner's supervisor, Ben Uteck, can be reached at (703) 308-3836.

Any inquiry of a general nature or relating to the status of this application should be directed to the receptionist whose telephone number is (703) 308-0661.

  
ROBERT KUNEMUND  
PRIMARY EXAMINER